

What is claimed is:

1. A piezoelectric ceramic comprising:

a composition including a first perovskite-type oxide, a second perovskite-type oxide and a tungsten bronze-type oxide,

wherein the first perovskite-type oxide includes a first element including sodium (Na) and potassium (K), a second element including at least niobium (Nb) selected from the group consisting of niobium and tantalum (Ta), and oxygen (O),

the second perovskite-type oxide includes a third element including an alkaline-earth metal element, a fourth element including zirconium (Zr), and oxygen, and

the content of the second perovskite-type oxide in the composition is less than 10 mol%.

2. The piezoelectric ceramic according to claim 1, wherein

the content of potassium in the first element is within a range from 10 mol% to 90 mol% inclusive.

3. The piezoelectric ceramic according to claim 1, wherein

lithium is further included as the first element, and the content of lithium in the first element is 10 mol% or less.

4. The piezoelectric ceramic according to claim 1, wherein

the content of the tungsten bronze-type oxide in the composition is 1 mol% or less.

5. The piezoelectric ceramic according to claim 1, wherein the tungsten bronze-type oxide includes:  
a fifth element including an alkaline-earth metal element;  
a sixth element including at least niobium selected from the group consisting of niobium and tantalum; and  
oxygen.

6. The piezoelectric ceramic according to claim 5, wherein the total content of tantalum in the second element and the sixth element is within a range from 0 mol% to 10 mol% inclusive.

7. The piezoelectric ceramic according to claim 1, wherein the composition is considered as a main component, and as a sub-component, at least one kind selected from the group consisting of elements of Groups 3 through 14 in the long form of the periodic table of the elements is included.

8. The piezoelectric ceramic according to claim 7, wherein as a first sub-component, the sub-component includes manganese as an oxide (MnO) within a range from 0.1 wt% to 1 wt% inclusive relative to the main component.

9. The piezoelectric ceramic according to claim 8, wherein

in addition to the first sub-component, as a second sub-component, the sub-component includes at least one kind selected from the group consisting of cobalt (Co), iron (Fe), nickel (Ni), zinc (Zn), scandium (Sc), titanium (Ti), zirconium (Zr), hafnium (Hf), aluminum (Al), gallium (Ga), indium (In), silicon (Si), germanium (Ge) and tin (Sn) as an oxide ( $\text{Co}_3\text{O}_4$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{NiO}$ ,  $\text{ZnO}$ ,  $\text{Sc}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{ZrO}_2$ ,  $\text{HfO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Ga}_2\text{O}_3$ ,  $\text{In}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{GeO}_2$ ,  $\text{SnO}_2$ ) within a range from 0.01 wt% to 1 wt% inclusive relative to the main component in total.

10. A method of manufacturing a piezoelectric ceramic, the piezoelectric ceramic including a first perovskite-type oxide, a second perovskite-type oxide and a tungsten bronze-type oxide, the first perovskite-type oxide including a first element including sodium (Na) and potassium (K), a second element including at least niobium (Nb) selected from the group consisting of niobium and tantalum (Ta), and oxygen (O), the second perovskite-type oxide including a third element including at least one kind selected from alkaline-earth metal elements, a fourth element including zirconium (Zr) and oxygen, the method comprising the step of:

calcining a mixture including elements of the first perovskite-type oxide, the second perovskite-type oxide, and elements of the tungsten bronze-type oxide.